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Innovative Methods for Environmental
Management of Solid Waste in Informal
Urban Settlements of Lima, Peru

Summary and Lessons Learned from the
Alternativa Demonstration Project

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by

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ABOUT THE AUTHOR

Eduardo Perez, an environmental engineer, program planner, and public policy specialist, has over 23 years of experience in water supply and sanitation, housing, urban development, and urban environmental sanitation. He is currently the EHP Technical Director for Engineering and Technology. He has worked on the WASH Project and EHP for the past six years directing and managing short-term technical assistance activities in support of USAID's environmental health programs. He also directs applied research efforts identifying lessons learned and best practices in providing basic environmental health services such as water supply, sanitation, solid waste management, and drainage to the urban poor. From 1985 to 1991, he was Country Director for the Cooperative Housing Foundation in Tegucigalpa, Honduras. In that capacity, he provided training and technical assistance to Honduran NGOs to implement home improvement and sanitation improvement loan programs for poor families living in the peri-urban/informal areas of primary and secondary cities of Honduras.

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1 BACKGROUND

Peru is experiencing explosive urban growth. This level of urbanization has significantly changed the nature of the country's urban and economic development and has overburdened the public sector's capacity to provide urban services. Furthermore, the urbanization process has resulted in rapid deterioration of the urban environment. It is estimated that approximately 150,000 persons currently emigrate to the Lima metropolitan area every year. Since there are no viable settlement options in the formal sector, more than 75% of the growth of the metropolitan Lima area has developed in the informal urban settlements. It is estimated that approximately 50% of the total population of Peru lives in informal settlements. These areas are generally established without formal permission and without access to basic urban environmental services (water, drainage, garbage collection, and lighting).

The northern sector of the Lima metropolitan area is known as the Northern Cone (Cono Norte). Cono Norte currently has a population of approximately 1.5 million inhabitants, of which nearly 70% live in informal settlements. It is estimated that the Cono Norte generates on the order of 590 tons of solid waste per day. Approximately 20% of this waste (118 tons) is not collected. Most of the uncollected waste is deposited in open dumps.

The inadequate management of solid waste has been identified by the Ministry of Health as one of the main problems affecting the environment and human health in Lima. Although the amount of per capita solid waste generated by the urban poor is generally less than the amount generated by high-income groups, the amount of uncollected waste is greater in the informal settlements than in the formal urban communities. This situation is exacerbated by the expansion of the informal business sector, which generates additional domestic and hazardous wastes. This inadequate solid waste collection has led to environmental contamination of the surface and

underground water resources (a high level of fecal coliform, lead, and cadmium have been found in the drinking water wells in the area), and contamination of the ambient air through the informal burning of solid waste.

Of cholera cases reported in the metropolitan area in 1993, 60% occurred in Cono Norte. The area has high rates of acute respiratory diseases, diarrheal diseases, typhoid, malaria, and conjunctivitis. In addition, high-risk behaviors are commonly observed including children playing in trash dumps, household pets eating from trash dumps, open air burning of trash piles near people's homes, and dumping of garbage near schools and parks. In addition, scavengers and animals invade neighborhood dumps, scattering the wastes, which then serve as breeding grounds for disease vectors, primarily flies and rats.

To address these problems, the U.S. Agency for International Development (USAID) supported Alternativa, a Peruvian nongovernmental organization (NGO), in the development and implementation of low-cost plans for solid waste management in the informal settlements of Lima's nine Cono Norte districts. USAID also asked the Environmental Health Project (EHP) to provide technical assistance to Alternativa in a wide range of technical and social areas.

This project sought to demonstrate a comprehensive and innovative approach to solid waste management that would be appropriate for Peru's informal settlements. A demonstration project was undertaken in two of the nine Cono Norte districts, Ancón and Ventanilla. A total of approximately 85,000 inhabitants live in both areas. It is estimated that this population generates an average of 31 tons of solid waste per day. Key elements of the approach designed by Alternativa included the following:

- C Increasing the involvement and participation of all stakeholders including community

members, grass-roots community groups, the informal sector business community, the private sector, and the municipality

- C Introducing a private sector market approach to providing basic urban services that is responsive to consumers' demand and willingness to pay
- C Reducing the total solid waste stream by creating ways to reuse, sell, and recycle various materials
- C Strengthening the public sector's capacity to

take on new roles in solid waste management that are appropriate and effective for peri-urban areas

- C Introducing innovative technologies that are appropriate and environmentally sustainable
- C Launching a comprehensive health education and social marketing campaign that will effectively change community- and household-level environmental sanitation behaviors

2 PROJECT DESCRIPTION

The project's objective was to implement an effective, replicable, low-cost solid waste management demonstration program that would improve environmental conditions in the informal urban communities where the urban poor live and would reduce the environmental health risks to the families living in those human settlements.

2.1 Activities Undertaken

This project was designed to demonstrate the sustainability and replicability of innovative methods of solid waste management in informal settlements. The characteristics or elements which were used as indicators of sustainability are as follows:

- C Involvement of the community
- C Involvement of the private sector
- C Creation of a loan fund
- C Development of products and services based on the market and on consumers' willingness to pay for the products and services
- C Introduction of low-cost, low-maintenance technologies
- C Evidence of household and community behavior change
- C Strengthened capacity of local authorities

Specific activities carried out under this project are as follows:

- C Design and implementation of a program to segregate and recycle household solid waste. This activity included a public education campaign; the design, purchase, and distribution of household garbage storage receptacles; the design and construction of a safe storage container for segregated waste materials (e.g., bottles, papers, plastics, tin cans); the search for buyers of these materials; and the training of the microenterprises. The production of compost from organic

household waste was also promoted. The project team considered reducing collection charges as an incentive to get households to segregate the solid waste at the source of its generation.

- C Expansion of household waste collection to nearly 100% of the families living in the human settlements through the expansion of existing microenterprises and the creation of new microenterprises (run by women). This activity included expansion of a loan program for acquisition of collection vehicles (tricycles), uniforms, and safety equipment such as gloves and masks. It also involved training and organizing workers for the new microenterprises and organizing a community environmental health committee.
- C Design and establishment of a new system for secondary storage and transfer to a sanitary landfill of all collected solid waste through expansion of the existing microenterprises. An agreement was reached with the municipalities to provide a concession to the microenterprises to expand and include secondary collection of solid waste for transport to sanitary landfills. The new technology included low-cost trailers and tractors. Training was provided along with access to credit for the acquisition of new technology.
- C Design and construction of two model sanitary landfills to serve the populations of Ventanilla and Ancón. A small-scale sanitary landfill was designed and built in Ancón. A larger sanitary landfill was constructed and maintained by the municipality of Ventanilla using heavy equipment.
- C Design and implementation of a social marketing campaign and sanitary education programs. (Samples of public information fliers are found in Appendix A.) This activity involved providing information about risks in the community; identifying and establishing

priorities with respect to environmental health problems; creating an environmental health committee in the community; health education training of the volunteer promoters; undertaking cultural environmental cleanup campaigns through the use of theater, contests (for example, which is the cleanest community), and posters; and using methods for creating a positive image.

- C Institutional strengthening of the municipality and community groups. This activity involved providing technical assistance at the request of the municipality charged with solid waste management with respect to management, accounting, and administration of the service; training grass-roots community groups to be effective organizers of their own community and to interact effectively with the municipality; and ensuring that the community has a voice in decisions about problems affecting it.
- C Follow-up, assessment, and dissemination of information related to the pilot activity. This activity included the follow-up and monitoring of activities, noting indicators of success. It also involved assessing lessons learned, developing information about the experience in an accessible form, and disseminating lessons learned and best practices for other NGOs, donors, and municipalities. A colorful 26-page publication about the project was published by Alternativa. (Sample pages are found in Appendix B. A copy of the full report is available on request from EHP.) A series of regional workshops facilitated discussion of the pilot activity at the national level and permitted involvement of other organizations such as universities and the Asociación de Municipalidades (Association of Municipalities).

The total number of direct beneficiaries of this project was 85,000 urban poor living in informal settlements.

2.2 Indicators of Success

Targets and indicators of success established for this project included the following:

- C Increasing the percentage of households in the peri-urban areas of the two communities that have solid waste collection service (the objective is to achieve close to 100% coverage).
- C Recovering a high percentage of domestic waste, which is then segregated and recycled from the 6,000 households selected for this effort (a pilot project within a pilot project). The objective is to recover 15 to 20% of the waste generated by households.
- C Ensuring that 100% of nonrecycled waste is adequately disposed of in sanitary landfills.
- C Increasing the community's knowledge and observing changes with respect to high-risk behavior related to solid waste (e.g., less burning of solid waste, fewer children playing in dumps, less depositing of waste in water channels, a visibly clean environment).
- C Establishing sustainable peri-urban environmental health community committees.
- C Increasing the number of families willing to pay for solid waste collection service and increasing the distribution of services.
- C Demonstrating the municipality's ability and skill in identifying and organizing the costs related to managing solid waste services.
- C Increasing the number of municipalities and communities that demonstrate concrete interest in imitating this solid waste management program.

3 RESULTS

Overall, USAID and EHP viewed the

demonstration project as a success. It provided an

important urban environmental service to a large population by improving solid waste collection services, improved environmental and health conditions in the communities and in the landfills, made significant progress in changing household and community behaviors regarding solid waste, strengthened the capacity of the local authorities, achieved a relatively high percentage of households directly paying for the services, and demonstrated that alternative, lower-cost technologies could provide a good level and quality of service. The major weakness of the project was that the solid waste collection microenterprises did not develop entrepreneurial skills that allowed them to become financially sound businesses.

Specific results of this project included the following:

- C Solid waste collection service coverage was extended to 95% of the target households in the two communities of Ancón and Ventanilla. This is a notable result given that proper household collection was not being carried out in these two communities prior to this intervention. A total of 15,500 families benefited from this project.
- C A total of 30% of the households segregated and recycled their domestic waste, resulting in an 18% reduction in the overall solid waste stream.
- C The remaining 82% of the solid waste collected was disposed of in sanitary landfills rather than in the unsanitary dumps previously used.
- C Over 70% of the households paid fees for solid waste collection.
- C Community-based environmental sanitation

areas. This has also decreased environmental contamination.

- committees were formed, which facilitated participation and input from the communities.
- C The capacity of local municipal authorities was strengthened. For example, local officials developed skills in using computer software tools for solid waste management. This capacity-building occurred mainly through one-on-one coaching rather than formal training sessions.
- C Significant behavior changes were achieved at both the household and community levels. Community-level consciousness was raised regarding the benefits of having a clean community free of solid waste. Once the prevailing public attitude supported a cleaner environment, peer pressure usually proved effective in preventing households from indiscriminate dumping of wastes in the neighborhood.
- C The project was effectively demonstrated to other municipalities, NGOs, donors, and others, resulting in multiple efforts to replicate the approach.
- C Burying hundreds of tons of waste in the Ancón sanitary microlandfill area has greatly improved environmental conditions since it has eliminated the immense dump that was a permanent source of contamination and a nesting ground for insects and rodents.
- C The collection of solid waste and its transfer to the sanitary landfill in the human settlements at Kilometer 39 of the Pan American Highway (Los Rosales, Los Alamos, Manuel Cox, Villa Estela, and Bahía Blanca) has resulted in the disappearance of garbage accumulating in the surrounding areas and in the open

4 LESSONS LEARNED

The Alternativa demonstration project was a rich experience that provided wide-ranging lessons that could be useful in future attempts to replicate or scale up similar efforts. These lessons include the following:

- C Solid waste management in Peru is the responsibility of local municipal authorities. The well-documented institutional weaknesses of these local authorities has led to inadequate provision of environmental services, especially solid waste management. The Alternativa demonstration project attempted to address this void. Nevertheless, the principal lesson learned from this activity was that success by private sector microenterprises is closely tied to the ability and willingness of the local authorities to support their efforts. When the local authorities were willing to work with Alternativa and the microenterprises in this project, the effort was much more successful than when the municipality could not or would not cooperate. Support required included developing formal contracts with the microenterprises that would give them the concessions to work in certain areas, providing payments for managing the landfill, and coordinating efforts with municipally collected waste. Future efforts may want to insist that the local authority be a key stakeholder and participate in the project design (and perhaps funding) to ensure a coordinated effort and the necessary political support.
- C The microenterprises were successfully trained by Alternativa in the technical aspects of solid waste collection and disposal, but they had great difficulty in becoming financially self-sufficient and continued their dependency on Alternativa. Key concerns

and supporting a strong community and household behavior change component.

were that the operators of the microenterprises did not have entrepreneurial skills that allowed them to run their businesses efficiently. In addition, since the microenterprises were created by Alternativa as part of a community effort, the proprietors often considered Alternativa their boss rather than viewing themselves as independent entrepreneurs. In future efforts, it may be beneficial to explore using existing informal private sector entrepreneurs (scavengers, for example) since they already have a good business sense.

- C The second major reason that the businesses were not financially viable is that, in general, the technical guidance that Alternativa gave in terms of level of service resulted in operational costs that were higher than consumers were willing to pay. For example, the microenterprises might have been financially viable if they had collected waste from houses twice a week rather than three times a week. Future efforts of this kind should determine what level of service households are willing to pay for and then provide that level of service.

Proper solid waste management is and will continue to be a critical requirement of urban areas. Effectively addressing this problem will contribute to improving environmental and health conditions and reducing health risks of poor families living in informal settlements. This project successfully demonstrated that improvement in solid waste management can be made by using appropriate technologies, involving households and community leadership, applying private sector principles,

APPENDIX A: Sample Public Information Fliers

APPENDIX B: Alternativa Publication—Manejo Ambiental de Residuos Solidos (Sample Pages)